CLAIMS

WE CLAIM:

1. A method for improving communication throughout a network, the network including a module capable of transmitting messages in response to a change of state, the method comprising:

detecting an error;

calculating a raw bit error rate;

correlating a residual error probability in response to the detected error rate; and,

executing a corrective action related to transmitting messages, the execution being activated in response to the residual error probability.

2. The method of claim 1 wherein executing a corrective action comprises retransmitting a message wherein redundant transmissions occur at a rate sufficient to bound the residual errors to a predetermined threshold.

3. The method of claim 1 wherein executing a corrective action comprises shortening the length of the message.

4. The method of claim 1 wherein executing a corrective action comprises ceasing transmission of the message.

5. The method of claim 1 wherein correlating a residual error probability utilizes maximum-likelihood filtering.

6. The method of claim 5 wherein the maximum-likelihood filtering utilizes Kalman filtering.

7. The method of claim 1 wherein correlating a residual error probability utilizes rate of deterioration (first time derivative of measured error rate).

8. The method of claim 1 wherein detecting the error utilizes a packet identifier, PID; PID is a code used for identifying of the components that forms a particular service in the transmitted datastream.

9. A method for reducing the effects of residual errors in a CAN network, the network including a module capable of transmitting messages in response to a change of state, the method comprising:

monitoring a detected error rate;

extrapolating an undetected error rate probability in response to the detected error rate;

executing a corrective action related to transmitting messages in response to the undetected error probability.

10. The method of claim 9 wherein executing a corrective action comprises repetitively transmitting a network message in response to a change of state wherein the repetitive transmissions occur at a rate sufficient to bound the undetected errors to a predetermined threshold.

11. The method of claim 9 wherein executing a corrective action comprises shortening the length of the message.

12. The method of claim 9 wherein executing a corrective action comprises ceasing transmission of the message.

13. The method of claim 9 wherein correlating an undetected error probability utilizes maximum-likelihood filtering.

14. The method of claim 13 wherein the maximum-likelihood filtering utilizes Kalman filtering.

15. The method of claim 9 wherein correlating an undetected error probability utilizes rate of deterioration (first time derivative of measured error rate).

16. The method of claim 9 wherein detecting the error utilizes a packet identifier.

17. An apparatus for reducing the effect of undetected communication errors transmitted throughout a network, the network having a module and being configured such that messages are transmitted from the module in response to a change of state of the module, the apparatus comprising:

means for determining an undetected bit error probability; and,

means for improving accurate message transmission being responsive to the means for determining an undetected bit error probability wherein undetected bit errors transmitted throughout the network are bound to a predetermined threshold.

18. The apparatus of claim 17 further comprising means for determining a detected bit error rate.

19. The apparatus of claim 18 wherein the means for determining a detected bit error rate comprises:

a bit error monitor for detecting bit errors;

a counter being operably responsive to the monitor, the counter being capable of tallying an amount of detected bit errors; and,

a calculator being operably connected to the counter, the calculator being capable of determining a detected bit error rate in response to the amount of detected bit errors.

20. The apparatus of claim 19 wherein the means for determining an undetected bit error probability comprises:

an extrapolator for correlating an undetected bit error probability in response to the determined detected bit error rate.

21. The apparatus of claim 17 further comprising:

a corrective action flag, the corrective action flag being set in response to the undetected bit error probability exceeding a predetermined threshold.

22. The apparatus of claim 17 wherein the means for improving accurate message transmission comprises:

a message repeater for repetitively transmitting messages throughout the network in response to a change of state and at a rate sufficient to bound the undetected errors to a predetermined threshold.

23. The apparatus of claim 17 wherein the means for improving accurate message transmission comprises:

a shortened message length.

24. The apparatus of claim 17 wherein the means for improving accurate message transmission comprises:

a message transmission terminator for ceasing transmission of network messages.

25. The apparatus of claim 17 further comprising:

a maximum-likelihood filter being operably connected to the extrapolator.

26. The apparatus of claim 25 wherein the maximum-likelihood filter is a Kalman filter.

27. The apparatus of claim 17 further comprising:

a differentiator being operably connected to the extrapolator for determining the first derivative of the calculated detected bit error rate.

28. The apparatus of claim 17 further comprising:

a packet identifier, the packet identifier being a portion of the message and being utilized by the bit error detector for detecting a message having an error.

30. An apparatus for reducing the effect of undetected communication errors transmitted throughout a network, the network having a module and being configured such that messages are transmitted from the module in response to a change of state of the module, the apparatus comprising:

a detector for detecting bit errors;

a counter for counting detected bit errors, the counter being operably connected to the detector;

a calculator for determining a detected bit error rate, the calculator being operably connected to the counter;

an extrapolator for correlating an undetected bit error probability, the extrapolator being operably connected to the calculator;

a predetermined undetected bit error probability threshold;

a comparator providing a corrective action signal, the corrective action signal being generated in response to a comparison of the undetected bit error probability and the predetermined threshold wherein the undetected bit error probability exceeds the predetermined threshold; and means for improving accurate message transmission being responsive to the corrective action signal wherein undetected bit errors transmitted throughout the network are bound to a predetermined threshold.

31. The apparatus of claim 30 wherein the means for improving accurate message transmission comprises:

a message repeater for repetitively transmitting messages throughout the network in response to a change of state and at a rate sufficient to bound the undetected errors to a predetermined threshold.

32. The apparatus of claim 30 wherein the means for improving accurate message transmission comprises:

a shortened message length.

33. The apparatus of claim 30 wherein the means for improving accurate message transmission comprises:

a message transmission terminator for ceasing transmission of network messages.

34. The apparatus of claim 30 further comprising:

a maximum-likelihood filter being operably connected to the extrapolator.

35. The apparatus of claim 34 wherein the maximum-likelihood filter is a Kalman filter.

36. The apparatus of claim 30 further comprising:

a differentiator being operably connected to the extrapolator for determining the first derivative of the calculated detected bit error rate.

37. The apparatus of claim 30 further comprising:

a packet identifier, the packet identifier being a portion of the message and being utilized by the bit error detector for detecting a message having an error.

38. A medium readable by a device being operably connected within a CAN network having a bus master and an I/O module operably coupled to a communication bus wherein the I/O module is subject to a state change, the medium containing instructions for improving network communication by reducing the effect of undetected errors, the medium comprising:

a first segment for detecting an error;

a second segment for calculating a bit error rate;

a third segment for correlating an undetected error probability in response to the detected error rate; and a fourth segment for executing a corrective action to improve message transmission throughout the network, the execution being

activated in response to the undetected error probability and the change of state of the I/O module.

39. The medium of claim 38 wherein the fourth segment retransmits a message wherein redundant transmissions occur at a rate sufficient to bound the residual errors to a predetermined threshold.

40. The medium of claim 38 wherein the fourth segment shortens the length of the transmitted message.

41. The medium of claim 38 wherein the fourth segment ceases module messages transmissions.

42. The medium of claim 38 wherein the third segment utilizes maximum-likelihood filtering.

43. The medium of claim 42 wherein the maximum-likelihood filtering utilizes Kalman filtering.

44. The medium of claim 38 wherein the third segment utilizes rate of deterioration of the calculated bit error rate.

45. The medium of claim 38 wherein the first segment utilizes a packet identifier.